

Amendment and Response

Applicant: Xiang Dai et al.

Serial No.: 10/612,663

Filed: July 2, 2003

Docket No.: 200308566-1

Title: SUPPORTING A CIRCUIT PACKAGE INCLUDING A SUBSTRATE HAVING A SOLDER COLUMN ARRAY

IN THE CLAIMS

Please amend claim 28 as follows:

1-7. (Cancelled)

8. (Previously Presented) An assembled electronic component system comprising:

a printed circuit board;

an integrated circuit package including a substrate and a lid, the substrate having a solder column array connected directly to the printed circuit board and the lid including an extended portion that extends directly from the substrate outwardly over an edge of the substrate, the integrated circuit package including four corners;

a plurality of supports that are separate and distinct from each other, the respective supports disposed directly on the printed circuit board and spaced apart from each other to position each respective support at the respective corners of the integrated circuit package, each support including a body and a pair of wings extending from the body to be substantially perpendicular to each other for contacting the edges of the substrate of the integrated circuit package and the wings of the support being sized and shaped to extend underneath the extended portion of the lid of the integrated circuit package, wherein the body is sized and shaped to extend outwardly in a direction generally opposite from the wings to be exposed relative to, and not in contact with the extended portion of the lid, wherein the wings of the support are sized and shaped to contact and vertically support the extended portion of the lid of the integrated circuit package ;

a compressive force mechanism applying a compressive force on the integrated circuit package against the printed circuit board , with the compressive force translated from the integrated circuit package to the printed circuit board through both the solder column array of the integrated circuit package and the wings of the supports via the extended portion of the lid of the integrated circuit package; and

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a heat sink removably secured on top of the lid of the integrated circuit package via the compressive force, the lid of the integrated circuit package being separate from and independent of the heat sink.

9. (Canceled).

10. (Previously Presented) The system of claim 8 wherein the solder column array has a first pre-assembly height and a second post-assembly height, the second post-assembly height being less than the first pre-assembly height.

11-12. (Canceled).

13. (Previously Presented) The system of claim 8 wherein each support includes a detent and the printed circuit board includes a plurality of holes shaped and sized for receiving the detent of the supports so that each support is secured to the printed circuit board upon insertion of the detent of the support into the hole of the printed circuit board.

14. (Previously Presented) The system of claim 8 wherein each support is made from at least one of a plastic material and a composite material, with the material having a coefficient of thermal expansion that is substantially the same as a coefficient of thermal expansion of the substrate and the solder column array.

15-20. (Canceled)

21. (Previously Presented) The system of claim 8 wherein the body of the support is sized, shaped, and positioned relative to the integrated circuit package to be secured relative to the printed circuit board via a fastener extending through the printed circuit board and into the body of the support.

22. (Canceled)

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23. (Previously Presented) The system of claim 8 wherein the supports are configured to be mechanically fastened to the printed circuit board without an adhesive and configured to vertically support the lid of the integrated circuit package without an adhesive between the extended portion of the lid of the integrated circuit package and the respective supports.

24. (Canceled)

25. (Previously Presented) The system of claim 8, wherein the electronic component system comprises a computer system.

26-27. (Canceled)

28. (Currently Amended) An assembled electronic component system comprising:

a printed circuit board;

an integrated circuit package including a substrate and a lid, the substrate including a solder column array directly connected to the printed circuit board and the lid including an extended portion that extends outwardly from the substrate over an edge of the substrate, the integrated circuit package including four corners;

a plurality of supports that are separate and distinct from each other, the respective supports disposed directly on the printed circuit board and spaced apart from each other to position each respective support at the respective corners of the integrated circuit package, with each support comprising a pair of wing portions that are generally perpendicular to each other and joined together at one end to define a corner of the respective supports, each wing portion of the respective supports extending underneath the extended portion of the lid of the integrated circuit package between the lid and the printed circuit board, and each wing portion of the respective supports being sized and shaped to contact and vertically support the extended portion of the lid of the integrated circuit package ;

a single band, separate and distinct from the respective supports, sized and shaped to surround and contact all of the respective supports and apply a lateral force against the wing

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portions and the corners of the respective supports to removably secure the respective supports in position underneath the extended portion of lid of the integrated circuit package and to maintain the respective supports in position relative to the printed circuit board;

a compressive force mechanism applying a compressive force on the integrated circuit package against the printed circuit board with the compressive force translated through both the solder column array and the wings of the respective supports via the extended portion of the lid of the integrated circuit package; and

a heat sink removably secured on top of the lid of the integrated circuit package via the compressive force with the heat sink being separate from and independent of the lid of the integrated circuit package,

29. (Previously Presented) The system of claim 28, wherein the electronic component system comprises a computer system.

30. (Previously Presented) The system of claim 28 wherein a height of the wing portions of the respective supports is substantially equal to a creep-induced height of the solder column array.

31. (Previously Presented) The system of claim 8 wherein a height of the wings of the respective supports is substantially equal to a creep-induced height of the solder column array.

32. (Previously Presented) An assembled electronic component system comprising:

a printed circuit board;

an integrated circuit package including a substrate and a lid, the substrate having a solder column array connected directly to the printed circuit board and the lid including an extended portion that extends directly from the substrate outwardly over an edge of the substrate, the integrated circuit package including four corners;

a plurality of supports that are separate and distinct from each other, the respective supports disposed directly on the printed circuit board and spaced apart from each other to

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position each respective support at the respective corners of the integrated circuit package, each support including a pair of wings substantially perpendicular to each other for contacting the edges of the substrate of the integrated circuit package and the wings of the support being sized and shaped to extend underneath the extended portion of the lid of the integrated circuit package to be in contact with, and vertically support, the extended portion of the lid of the integrated circuit package;

a compressive force mechanism applying a compressive force on the integrated circuit package against the printed circuit board, with the compressive force translated from the extended portion of the lid of the integrated circuit package to the printed circuit board through both the solder column array of the integrated circuit package and the wings of the supports, wherein a height of the wings of the respective supports is substantially equal to a creep-induced height of the solder column array of the integrated circuit package; and

a heat sink removably secured on top of the lid of the integrated circuit package via the compressive force, the lid of the integrated circuit package being separate from and independent of the heat sink.

33. (Previously Presented) The system of claim 32 wherein each support is made from at least one of a plastic material and a composite material, with the material having a coefficient of thermal expansion that is substantially the same as a coefficient of thermal expansion of the substrate and the solder column array.

34. (Previously Presented) The system of claim 32 each support including a body that extends outwardly in a direction generally opposite from the wings to be exposed relative to, and not in contact with the extended portion of the lid, the body of the respective supports being directly secured to the printed circuit board.

35. (Previously Presented) The system of claim 32 wherein the supports are configured to be mechanically fastened to the printed circuit board without an adhesive and configured to vertically support the lid of the integrated circuit package without an adhesive between the lid of the integrated circuit package and the respective supports.